# SUMMARY RESEARCH REPORT ON CRITICAL SUCCESS FACTORS IN FEDERAL GOVERNMENT PROGRAM MANAGEMENT

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This pilot study identifies critical success factors common to government acquisition programs. It demonstrates that how these factors are identified and used, how they are measured, and how they are influenced should be a mandatory component of education for every federal government program manager or program manager selectee.

An objective of program management, and of program management education, is repeatable success as a program manager. It does little good if managers are considered successful but do not know why they were successful and do not know how to repeat their successes. Success that is the result of luck is not really success.

The use of critical success factors (CSFs) in the management of corporations has been the subject of several published studies. The research we describe here investigated CSFs as they apply to acquisition programs within the Department of Defense (DoD). The use of CSFs in the development of critical management information systems for the DoD program manager would have significant benefit.

Although profit-driven private sector companies have virtual autonomy in their selection of suppliers and partners, researchers investigating CSFs had largely ignored federal government projects at the time this study was done. Since then, a few federal agencies have reported CSFs for their organizations, but none of the reports published have indicated how the data was captured or validated, nor have they provided a CSF-based measurement process. The activity in this area within the federal departments therefore seems to be at a fairly preliminary stage of development.

The questions we sought to answer in this pilot study are:

- Are there any general CSFs for DoD programs?

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- Are there any CSF-related measures, quantitative or qualitative, that can be used on DoD acquisition programs?

- Are there any significant differences in the CSF data between weapon systems and automated information systems (AIS)?

## The Initial Research Environment

The importance of CSFs in management first gained widespread attention following publication of an article by J. F. Rockart (1979). It showed the need among top executives for certain critical elements of information, notg provided by the management information systems (MIS) or the data analysis systems available. Rockart defined CSFs as:

> …the limited number of areas in which results, if they are satisfactory, will ensure successful competitive performance for the organization. They are the few key areas where things must go right for the business to flourish. If results in these areas are not adequate, the organization's efforts for the period will be less than desired.

He further described them as "areas of activity that should receive constant and careful attention from management."

Rockart showed that executives suffered from data overload, but were starved for the right kind of data essential to making the decisions necessary to manage their enterprises effectively. This includes the identification of CSFs as well as the establishment of indicators that can alert the executive when a CSF is changing or when the assumption upon which a CSF is based is no longer valid.

The initial Rockart paper was closely followed by the publication of a methodology for CSF identification developed by Bullen and Rockart (1981). The research conducted since then has been done either through the interview process as described by Bullen and Rockart, or by the questionnaire method.

## Critical Success Factors

Identifying and managing CSFs, and tracking them separately from the ever-increasing amount of data to which executives are subjected, has been the focus of significant private sector research. Some of the research has limited the study to those activities over which the program manager has direct control (Cleland and King, 1988); the majority of researchers

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have broadened the focus to include elements beyond the direct control of a project manager, but still within the sphere of things that either he could manage, or that could exert significant influence on his activities.

Bullen (Bullen and Rockart, 1981) has suggested that CSF identification be focused on whether CSFs fall into one or more of several key areas. These key areas, plus one (modification management) we have added, are:

- Global or industry related: These are activities essential to project success that would be true of any project or company operating in the particular environment (industry or business area).

- External influences: These CSFs are governed by external factors that can significantly influence the success of your endeavor.

- Internal influences: These are determined by internal factors that can significantly influence project success.

- Current and future: Included here are time-driven CSFs that are essential to project success. Current CSFs are activities that must be done in the near future. Future CSFs are those which are long range. Planning for the success of future CSFs may be an activity that requires immediate attention.

- Temporal and enduring: These are significant influences that either have a short-term duration or are present through most or all of a project.

- Risk abatement: Some activities are necessary in order to avoid significant identified risks to project success.

- Performance: These are identifiable levels of performance or achievement that must be realized for the project to be successful.

- Special monitoring: These activities or events require special monitoring, protection, or contingency planning in order to assure project success.

- Quality: Quality requirements, if not met, will mean the failure of the project.

- Modification management: Some activities or conditions that currently exist or are currently planned will, if not changed, cause the project to fail.

## Review of the Literature

Most research has been focused on the identification of CSFs for executive level managers in specific industries, or heads of specific kinds of departments, principally MIS departments. There has also been some minimal research focused on the diversity of applications of CSFs. One fairly common problem with much of the reported research is that many of the identified CSFs have not been stated in the form of an activity, as was clear in the original group of definitions given by Rockart and noted above. This led to the identification of CSFs that were ambiguous and hard to measure.

One of the early research studies that demonstrated this problem was conducted

by Boynton and Zmud (1984). This research focused on the use of CSF, and showed that CSF analysis can be used successfully to identify key concerns of senior MIS management, can be used in developing strategic plans, and can help identify critical implementation issues. CSFs can also be used to help managers achieve high performance and establish guidelines for monitoring a corporation's activities.

Boynton and Zmud also noted that CSF analysis demonstrated certain weaknesses. They found that CSFs were difficult to use unless analysts possess the capability to successfully apply an identification process. Some analyst or manager bias may be introduced through the interview process, and if used as a requirements analysis methodology the resulting information model may not accurately represent the deployment environment. But the researchers concluded that, despite these criticisms, the CSF method generates user acceptance among senior management, it works well at the policy, operational, and strategic levels of information resource planning. It forms a bridge between corporate strategic interests and information systems (IS) strategic planning.

"This research focused on the use of CSF, and showed that CSF analysis can be used successfully to identify key concerns of senior MIS management, can be used in developing strategic plans, and can help identify critical implementation issues."

Boynton and Zmud (1984) also found that CSFs can help identify issues that merit close management attention, their intended purpose, and they are useful for requirements analysis in building conceptual models of an organization or a manager's role. This may not be appropriate, however, where managers have difficulty conceptualizing. Their data supported the assertions that CSFs generate enthusiasm from senior managers, improve user communications, and build managerial support for information technologies, and that CSFs were particularly successful in defining organizational information infrastructures. Their data also indicated that lower-level managers may have difficulty formulating meaningful CSFs and specific information measures. This finding underscores the need for specific training in CSF identification and analysis processes and the need to describe these factors in terms of activities.

Boynton and Zmud (1984) conclude that the weaknesses attributed to CSFs can be overcome through careful application of the method, while CSF strength as a structured design process for eliciting both MIS plans and managerial information needs is key to its success.

In another significant study, "Variation of Critical Success Factors Over Stages in the Project Life Cycle" (Pinto and Prescott, 1988), the authors hypothesized a set of CSFs, and then conducted a validation study based on empirical evidence. The objective was to identify a set of CSFs for each life cycle phase that were general rather than company- or industry-specific, and to determine the relative importance of the CSFs across life cycle phases. The final set of CSFs were identified and related to the life cycles during which they were important (see Table 1).

Several identified CSFs demonstrate the difficulty of not specifying the factor in terms of an activity. It is difficult to measure, and therefore difficult to know whether an activity has been done well, when it is specified in terms as ambiguous as "technical tasks" or "project mission."

Zahedi (1987) developed an evaluation of reliability of an information system as a measure of the system's success based on CSFs. This research addressed the issue of the difference between behavioral and perceived measures of IS effectiveness resulting from a lack of conceptual foundation to guide proper measurement development, and the absence of a rigorous program of measurement validation. It identified the need to define CSFs and identify how they are interconnected. This was another look at a question similar to that investigated by Pinto and Prescott (1988), but looking at the set of CSFs from a reliability viewpoint. In each case the CSFs were not treated as isolated objects but rather activities that are interrelated.

In "The Multiple Uses of CSFs" (Leidecker and Bruno, 1984), the authors stress the applicability of CSFs for strategic planning and business strategy development, identification of threats and opportunities, and identifying a criteria for strengths and weaknesses assessment.

Walsh and Kanter (1988) stress the importance of using the CSF identification process to identify major causes of project failure and then ranking these major causes by relative value, so that such problems can be avoided in future programs.

One of the few comparative studies done (Chung, 1987) concluded that if the inquirer wants to know what management is, then the process view should be studied. However, if one wants to know why

Table 1.
Importance of Various Critical Success Factors in the Project Life Cycle

| Phase | CSF |
|---|---|
| Concept | Project mission<br>Client consultation |
| Planning | Project mission<br>Top management support<br>Client acceptance |
| Execution | Project mission<br>Troubleshooting<br>Well-defined schedule or plan<br>Technical tasks<br>Client consultation |
| Termination | Project mission<br>Technical tasks<br>Client consultation |

selected organizations are successful in highly competitive environments, then one must study the three critical success factors of corporate strategies, human resources, and operational systems. His conclusion is that the truly successful companies deal with these three CSFs differently from the way they are treated in other companies.

More recently, the research has continued with the same commercial emphasis as described above, but applied to current business trends. One group studied critical success factors as they apply to establishing strategic alliances (Rai, Borah, and Ramaprasad, 1996). A further study of CSFs in business alliances, this time with a process focus in the oil and gas industry, was reported in the trade press ("Seven Critical Success Factors," 1996).

"CSF analysis has also been applied directly to people, to measure productivity."

CSF analysis has also been used for community improvement. This is closer to the public sector than most studies, and is an example of the analysis being applied to a fairly narrow focus area (VanDeusen, 1996). The researcher gleaned six factors from 14 community-scale future search conferences conducted between 1993 and 1995. These CSFs are leadership, scope, participation, structure, results, and strong conference management.

Note once again the ambiguity and the problem when CSFs are not specified in terms of activities. It is very difficult to measure something like "structure" or "scope" or even "leadership," especially when something like leadership can be defined and measured in so many different ways.

Business processes for new product development have not escaped the application of CSF analysis. A benchmarking research study of 161 business units (Cooper and Kleinschmidt, 1996) identified the CSFs for new product performance at the business unit level. The researchers found that the CSFs fell into major categories. Two key performance dimensions—profitability and impact—were identified. Four key drivers were identified: a high-quality new product process, the new product strategy for the business unit, resource availability, and research and development spending levels. Merely having a formal new product process had no impact.

CSF analysis has also been applied directly to people, to measure productivity. Christine Bullen, one of the leaders in the application of CSF analysis, completed a research study of knowledge worker productivity (Bullen, 1995). She found that the context-specific nature of personal productivity demands an understanding of the processes by which knowledge workers achieve their goals and objectives. Once the nature of personal productivity is understood, measurement becomes a much simpler task and the measures have real meaning.

These studies all show how CSF analysis is applicable to a wide variety of industries and subsets of industries. CSF analysis has also been effectively applied to individual process areas within a corporation, such as strategic planning and information technology implementation, although it is not routinely found as a part of strategic management.

Research on the application of CSFs to program management, and in particular

military program management, is lacking. Research on evaluating the true criticality of identified CSFs is lacking in any environment, government or private sector. There is an implied assumption in much of the research to date that managers are relatively equal in their ability to identify CSFs that truly are critical to project success.

## The Research Method

This research was conducted using the survey questionnaire method. The survey instrument was developed based on the CSF categories identified by Bullen (1995), as noted above, plus the one category added by these researchers. In the instrument, the participants were asked to identify both CSFs according to the indicated categories as well as their recommended associated measures for each CSF. The instrument was mailed to two groups of program managers; those managing embedded system programs and those managing automated information systems. The returns were analyzed and the data captured so that responses could be made to the initial research questions. Data was separated between the two groups of program managers, and the results were examined for each group individually as well as comparatively so that common CSFs and measures could be identified. The findings were evaluated on this basis.

Having selected the survey approach, the set of program managers to whom the questionnaire was sent was obtained from lists maintained by the Information Resources Management College (IRMC) of the National Defense University in Washington, DC, and by the Defense Systems Management College (DSMC) at Ft. Belvoir, VA. Those from the IRMC were program managers for the development of non-weapon systems, and are identified as Group B. Those from the DSMC list were program managers for the development of systems that are identified as embedded systems, typically weapon systems, and identified as Group A.

> "Research on the application of CSFs to program management, and in particular military program management, is lacking."

## Initial Research Results

### CSF Identification

The data received was broken down into two groups. The Group A universe was 73 program managers. There were 20 Group A returns. The Group B universe was 57 program managers (14 returns).

The returns were examined for identification of CSFs and related measures that might be, or are being, used. No one program manager reported more than 10 CSFs. The Group A program managers collectively reported 37 different CSFs. The Group B program managers reported 29 different CSFs. Some reported CSFs, even though they were not stated in exactly the same words, were similar enough in wording that they could be combined. This distillation left us with 18 CSFs common to both groups.

It should be noted that a few other CSFs were identified in addition to those

reported here. These were very specific to the particular program and are therefore not included in this report because this research effort sought to determine if there were CSFs that applied generally within Group A and Group B, and if there were any common to both groups.

### Measures

The respondents were asked to identify measures they use, or thought they should use, for each CSF they identified. There was no requirement to limit the number of measures for each CSF. The Group A respondents identified 41 different measures. Each Group A respondent identified a total of at least 6 measures. The Group B respondents identified a total of 29 different measures. Three of the respondents for Group B identified no measures. One other Group B respondent indicated that there were too many factors required to come together for success and the only real measure is the ultimate outcome.

"The CSF identification data was compiled and ranked by priority."

### Sysyem Size

Program size was requested in terms of dollar value of the total procurement. The responses received for Group A indicated total program sizes from $45 million to $30 billion. The responses received from Group B indicated program sizes from $400,000 to $3 billion.

### Data Analysis Process

The CSF identification data was compiled and ranked by priority. Each CSF was given a number, and the number of times each was identified was recorded. Those CSFs identified most frequently were ranked highest in priority. This same analysis was done for both Group A and Group B. Those CSFs identified as being common to both Group A and Group B were also ranked in terms of frequency of response.

Measures identified by the respondents are given in a separate chart. The measures reported were also examined for their applicability to the CSF identified. They were also examined in terms of their priority. If a critical success factor was seen as high priority, we judged whether this was reflected in the measures identified for that CSF.

## Analysis and Findings

Table 2 presents the CSFs from the Group A responses. A unique component of the Group A response for CSF Number 4, "technically competent program office staff," is establishing system engineering expertise within the program office. This aspect of technical competency was not present in the Group B responses. Table 3 shows Group B CSFs. Note that "stable and adequate budget" was the most frequently cited factor. Its prominence in comparison to the other factors was not as dramatic as the most prominent CSF in Group A. Of the 18 CSFs common to both lists, there were evident differences in emphasis, both in terms of frequency of reporting between the two groups as well as the subtleties of their content (Table 4).

Table 2. Group A Critical Success Factors in Priority Order

| CSF No. | Times | Factor |
|---|---|---|
| 12 | 15 | Continuous meaningful visibility using measures |
| 4 | 9 | Technically competent program office staff |
| 2 | 9 | Clearly defined and stable requirements, including interface |
| 1 | 8 | Stable and adequate funding |
| 3 | 5 | Risk management |
| 7 | 5 | Schedule management |
| 15 | 5 | Stable, qualified industrial base |
| 17 | 5 | Effective vertical and lateral communications |
| 16 | 4 | Management political influencing agents |
| 6 | 3 | Stable and adequate personnel resources |
| 8 | 3 | Cost management |
| 9 | 3 | User involvement, support, and acceptance |
| 10 | 3 | Strong and structured quality control |
| 11 | 2 | Clearly and objectively defined project goals |
| 19 | 2 | Development and execution of program management strategic plan |
| 22 | 2 | Change management |
| 5 | 1 | Configuration management and control |
| 13 | 1 | Other agency support for training and government-furnished equipment (GFE) |
| 14 | 1 | Adequate program office resources |
| 18 | 1 | Leadership |
| 20 | 1 | Thorough system documentation |
| 21 | 1 | Test and evaluation master plan approval |
| 23 | 1 | Program office teamwork |
| 24 | 1 | Effective and timely decision making |
| 25 | 1 | Foreign military sales |
| 26 | 1 | Measure and control integrated logistics support performance |
| 27 | 1 | Initiation of new projects |

Table 3. Group B Critical Success Factors in Priority Order

| CSF No. | Times | CSF |
|---|---|---|
| 1 | 10 | Stable and adequate budget |
| 9 | 9 | User involvement and support |
| 12 | 9 | Effective technical performance evaluation |
| 2 | 8 | Detailed requirements analysis |
| 4 | 8 | Technically competent staff |
| 19 | 7 | Top management support |
| 17 | 6 | Effective lateral and vertical communications |
| 7 | 6 | Schedule management |
| 10 | 6 | Strong quality control program |
| 6 | 5 | Stable project staff |
| 16 | 5 | Management of political influencing agents |
| 13 | 4 | Other agency support: Training and GFE |
| 3 | 3 | Risk management |
| 20 | 3 | Strong knowledge of life cycle management |
| 23 | 3 | Incremental acquisition |
| 8 | 2 | Cost management |
| 22 | 2 | Common sense |
| 11 | 2 | Clearly defined mission |
| 14 | 2 | Adequate program office resources |
| 21 | 1 | Objective economic analysis |
| 18 | 1 | Leadership |
| 15 | 1 | Stable, qualified industrial base |
| 5 | 1 | Configuration management |
| 24 | 1 | On-site team to prevent fraud, waste, and abuse |

## Overall Observations

Given the publicity generally afforded to configuration management, it was a surprise that this factor was named only once in each group. This could mean that those reporting did not recognize the importance of configuration management, or recognized its importance, but believe it

Table 4. SFs for Groups A and B Combined, in Priority Order

| CSF No. | Times | CSF |
|---|---|---|
| 12 | 24 | Continuous meaningful visibility using measures |
| 1 | 18 | Stable and adequate funding |
| 18 | 2 | Leadership |
| 2 | 17 | Clearly defined and stable requirements, including interface |
| 4 | 17 | Technically competent program office staff |
| 9 | 12 | User involvement, support, acceptance |
| 7 | 11 | Schedule management |
| 17 | 11 | Effective vertical and lateral communications |
| 10 | 9 | Strong and structured quality control |
| 16 | 9 | Management of political influencing agents |
| 3 | 8 | Risk management |
| 6 | 8 | Stable and adequate personnel resources |
| 15 | 6 | Stable, qualified industrial base |
| 13 | 5 | Other agency support for training and GFE |
| 8 | 5 | Cost management |
| 11 | 4 | Clearly and objectively defined project goals |
| 14 | 3 | Adequate program office resources |
| 5 | 2 | Configuration management and control |

is done well enough now not to be a prime candidate for program manager attention.

The questionnaire asked the program manager to list activities that were believed to be critical to the success of the program. Issues reported will, in some way, reflect those areas that have required a significant degree of program manager attention.

Another unexpected result was the placement in order of prominence in which risk management appeared in the Group B list, being number 13 in order of frequency of response. This same CSF is ranked number 6 in order of importance in Group A.

With regard to the CSFs common to both groups, the list reflects a strong belief that factor number 12, continuous meaningful visibility using measures, is of primary importance to program success for any system. Stable and adequate funding, clearly defined and stable requirements, and technically competent program

office staff were the factors next in order of importance, and these three are nearly equal in prominence. These four CSFs appeared more prominently than either cost management or schedule management. This may reflect a belief that if these top four CSFs are accomplished, cost management and schedule management are more easily accomplished. This may also suggest that the focus of the external oversight groups—cost and schedule—is not among those activities that are most important to program success, at least not as viewed by those responsible for executing the mission of program management.

One must also recognize that the CSFs identified are not necessarily disjoint. For example, the factor continuous and meaningful visibility will be a necessary component of risk management. This is likewise true of the CSFs strong and structured quality control, and technically competent program office staff. All of these tend to be means for managing program risk.

## MEASURES

Analysis of the measures was accomplished in light of the identified CSFs. It was expected that the most frequently mentioned CSFs should have measures reflecting them, and those with minimal mention may be expected to have the least number of measures.

Table 5. Group A Measures in Priority Order

| No. | Frequency | Measure |
|---|---|---|
| 1 | 10 | Stable and adequate budget |
| 5 | 10 | Deviation from schedule |
| 4 | 8 | Deviation from cost |
| 2 | 7 | Number and frequency of requirements changes |
| 6 | 7 | Number of unique trouble reports |
| 3 | 4 | Changes to the budget |
| 8 | 4 | Results of tests of independent systems |
| 20 | 4 | Cost of change versus cost of delay equals cost to improve |
| 9 | 3 | User or contractor walkthroughs and reviews |
| 12 | 3 | Funding level versus plan |
| 7 | 2 | Number of customer complaints |
| 10 | 2 | Prime contractor productivity per 7000.2 |
| 16 | 2 | Program plan assessment (qualitative) |
| 21 | 2 | Number of reworks or rewrites |

(continued)

Table 5. Group A Measures in Priority Order (continued)

| No. | Frequency | Measure |
|---|---|---|
| 23 | 2 | Time between problem occurrence and problem identification |
| 25 | 2 | Time delay of GFE deliveries |
| 1 | 1 | Quantitative assessment of requirements |
| 11 | 1 | Program quality targets |
| 13 | 1 | VROC, mean time between failures (MTBF), Pd, mean time to repair (MTTR) |
| 14 | 1 | System availability |
| 15 | 1 | Response to change (qualitative) |
| 17 | 1 | Number of issues requiring higher approval |
| 18 | 1 | Time taken for approval decisions |
| 19 | 1 | Number of acquisition protests |
| 22 | 1 | Number of first time approvals |
| 24 | 1 | Time to process approved change |
| 26 | 1 | Workload stability |
| 27 | 1 | Number and effect of Congressional interactions |
| 28 | 1 | Effectiveness of visibility processes |
| 29 | 1 | Number of delay or disruption claims from contractor |
| 30 | 1 | Reject rates |
| 31 | 1 | Number of quality deficiency reports |
| 32 | 1 | RAM measures |
| 33 | 1 | Number of miscues per month (no coordination; misunderstand) |
| 34 | 1 | Number of technical surprises per month |
| 35 | 1 | Number of suggestions adopted by contractor |
| 36 | 1 | Number of delinquent action items—days late |
| 37 | 1 | Cost versus operational effectiveness |
| 38 | 1 | Number of risks identified, month |
| 39 | 1 | Number of risks resolved per month |
| 40 | 1 | Number of qualified staff versus need |
| 41 | 1 | Number of physical resources versus need |

In Group A (Table 5), the most frequently mentioned measure is number 5, deviation from schedule. The next most frequently mentioned measure is number 4, deviation from cost. This may be reflective of the ease of data collection, and the need to respond to the program executive officer, the GAO, Congress, and the Defense Acquisition Board, rather than focusing on those activities that the program managers clearly felt were of significantly superior importance to program success.

Given the importance afforded the CSF identified as continuous visibility, a number of measures can be considered reflective of this CSF. They are shown in Table 6. In terms of sheer volume, these measures reflect the importance afforded continuous visibility. However, they were distributed across the spectrum of those reporting, and the majority of the measures were only identified once, an obvious cause for concern. The two most frequently mentioned of all the visibility measures are those related to requirements changes and those related to trouble reports. The next most frequently mentioned measure was number 8, test results.

Walkthroughs and reviews, number 9, a widely publicized source of visibility,

Table 6.
Measures Reflecting the Importance of the CSF Continuous Visibility

| No. | Frequency | Measure |
|---|---|---|
| 2 | 7 | Number and frequency of requirements changes |
| 6 | 7 | Number of unique trouble reports |
| 8 | 4 | Test results |
| 9 | 3 | Walkthroughs and reviews |
| 7 | 2 | Number of customer complaints |
| 10 | 2 | Contractor productivity |
| 1 | 1 | Quantitative assessment of requirements |
| 11 | 1 | Program quality targets |
| 13 | 1 | VROC, MTBF, Pd, MTTR |
| 14 | 1 | System availability |
| 28 | 1 | Effectiveness of visibility process |
| 31 | 1 | Number of quality deficiency reports |
| 32 | 1 | RAM requirements |
| 34 | 1 | Number of technical surprises per month |
| 38 | 1 | Number of risks identified per month |
| 39 | 1 | Number of risks resolved per month |

Table 7. Group B Measures, in Priority Order

| No. | Frequency | Measure |
|---|---|---|
| 4 | 4 | Deviation from cost |
| 5 | 4 | Deviation from schedule |
| 6 | 4 | Number of unique trouble reports |
| 10 | 3 | Program reviews |
| 12 | 3 | Product quality |
| 22 | 3 | System throughput (performance) |
| 2 | 2 | Number of system requirements changes |
| 3 | 2 | Budget changes |
| 13 | 2 | Funding level versus plan |
| 16 | 2 | User feedback |
| 20 | 2 | External and internal independent verification and validation |
| 7 | 2 | Number of customer complaints |
| 1 | 1 | Requirements review |
| 8 | 1 | User acceptance |
| 9 | 1 | Test results data reports |
| 11 | 1 | Productivity |
| 14 | 1 | System reliability |
| 15 | 1 | Downtime: Rate and duration |
| 17 | 1 | Progress demonstration |
| 18 | 1 | Contractor product demonstrations |
| 19 | 1 | Personnel evaluations |
| 21 | 1 | Milestone resource review |
| 23 | 1 | System backlog |
| 24 | 1 | Analysis reports |
| 25 | 1 | Evaluation against oversight criteria |
| 26 | 1 | Number of support complaints |
| 27 | 1 | Number of software changes |
| 28 | 1 | Time to complete software change |

was only mentioned three times. This is cause for some concern, both because of what walkthroughs and reviews can provide that is not being used, and because of the need to assure that these visibility mechanisms are properly reflected in the acquisition process, particularly in the request for proposal and the contract. For CSF number 4, technically competent program office staff (the second most frequently mentioned CSF), there are virtually no measures reflected.

It is evident that there is a lack of correlation between those activities identified as CSFs for Group A and therefore deemed critical to program success, and the measures used or suggested. The number of measures related to the top priority CSF, but that were only reported once, reflects a lack of consistency among those engaged in acquisition activities in terms of how commonly recognized critical activities can and should be evaluated.

"One clear concern is that if program managers recognize certain activities to be critical to program success, and the program manager's information network does not provide measures reflective of those critical factors, then their ability to manage those factors is jeopardized."

In general for Group B (Table 7), the lack of dominance of any one measure, and the deviation of the three measures deviation from cost, deviation from schedule, and number of unique trouble reports being the most frequently named, may be reflective of a general lack of familiarity with quantitative evaluation processes as well as a lack of consistency among those engaged in non-weapon system acquisition in terms of how those activities deemed critical to success can and should be evaluated.

Although CSF number 2, detailed requirements analysis, is noted eight times, measure number 1, requirements review, was only mentioned once, and measure number 2, number of system requirements changes, was only mentioned twice. A total of 16 of the 28 measures reported were only mentioned once. Six of the measures were only mentioned twice. Therefore, only 6 of the 28 measures were mentioned more than twice, although 11 of the 24 CSFs for Group B were listed at least five times. There is a clear lack of correlation between the activities considered critical to program success and the management information available by which the program managers can measure, evaluate, and make use of those critical factors. The most frequently named measures are more reflective of response to oversight groups than they are of the issues actually considered by the program managers as most critical to program success.

One clear concern is that if program managers recognize certain activities to be critical to program success, and the program manager's information network does not provide measures reflective of those critical factors, then their ability to manage those factors is jeopardized. The information system used by the program office will not be sufficiently supportive of the program needs.

## FINDINGS

Based on the above, we can list a number of findings.

- The CSFs for DoD program management are identifiable, and their explicit identification would clearly assist the program managers in maintaining management focus on the factors most important to program success.

- A significant number of CSFs are common to both Group A and Group B types of programs.

- The component assumptions and emphasis for a given CSF common to both Group A and Group B may be slightly different. This difference is largely a function of the difference between the missions of the two groups, Group A being more concerned with the complete development of total systems than is Group B.

- The CSFs identified by the program managers as the most significant for program success are not those factors that receive the most attention from the oversight activities and agencies.

- The measures identified most often by the program managers as those used or recommended are significantly more oriented toward cost and schedule (which must be briefed to the oversight agencies) rather than toward factors identified by the program managers in the field to be most critical to the program success.

- There is no widely recognized and generally used set of measures consistent with the most frequently reported CSFs. This leads to the conclusion that even though various factors are recognized as critical, they are not usually explicitly identified and the information network required to manage against those critical factors is not developed.

- A commonly recognized set of CSFs, and a consistent measurement-based information network based on these CSFs, would be of significant benefit to the program managers as well as the oversight agencies. Such a management system would significantly improve the management success potential on programs across the board, and would provide the external groups a consistent way of evaluating and comparing different programs so that recommendations for future improvements could be intelligently based.

- A CSF-based information network for program management would lend itself to not only increased visibility and awareness for the program manager and staff during all life cycle phases, but would provide the base for the establishment of measures for determining when the underlying assumptions for a given CSF may be changing.

- A CSF-based information network would provide a common framework for productive discussions between the program manager and the external groups, including the development contractors, and would greatly support the effectiveness of IPTs.

- A CSF-based information network would significantly reduce the duplicative reporting and diversions the program managers experience under the present conditions.

- A CSF-based analysis process would be a significant teaching instrument for educating prospective program managers in strategic thinking in terms of those considerations critical to success.

### Some Limitations

The survey questionnaire process used for this research project has both strengths and weaknesses. An inherent strength of the questionnaire approach lies in the number of program managers who can be accessed simultaneously, with the resultant savings in time and dollars. It provides a neutral and standardized method of data collection and allows those responding to provide not only the identification of CSFs, but also a view of the assumptions underlying the CSFs and the ways in which they can be measured.

"An inherent strength of the questionnaire approach lies in the number of program managers who can be accessed simultaneously, with the resultant savings in time and dollars."

One of the weaknesses of this process is the lack of opportunity to discuss a question with the program manager and draw out responses that fully consider the question and its implications. This can be very important when seeking responses from managers with regard to a concept or process they are not already familiar with. It is subject to a certain degree of bias on the part of those responding and does not allow for pursuit of additional issues that might be important to the result and which might not be explored without the aid of a skilled interviewer. In addition, there is no protection from the tendency to either not respond at all, to have a subordinate provide the responses, or to respond hastily without giving the matter the intellectual time it requires.

## Recommendations

Based on the information provided above, we recommend the following.

- Educate program managers and their staff in the CSF identification process. The failure to explicitly identify CSFs for a program will invariably result in the continued focus on cost and schedule after they become problems, will inhibit the development and use of effective life cycle measures, and will prevent the development of a truly effective program management information system. Cost and schedule problems are generally effects, not causes. They are the results of conditions that should be identified and managed much earlier than the time when a cost and schedule variance first appears.

- Educate the oversight agencies in the CSF identification process and the importance of this to their management functions.

- Educate the program managers and their staff in development of information networks consistent with the critical success factors.

- Establish oversight reporting mechanisms consistent with critical success factors so that critical information is reported when it is needed.

## CONTINUING RESEARCH

Research is currently being conducted using an interview process. The results will reflect whether there are any changes to the CSFs reported by program managers that may result from acquisition reform policy initiatives. Continued research is also being conducted to produce a model for evaluation of actual criticality of reported CSFs. It is anticipated that the development of this model will provide a means to alleviate the need to assume that all managers are equally skilled in their ability to identify CSFs and engage in effective strategic thinking.

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